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60130-2065
02MRA0243

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Coleman et al.
Serial No.:	Unknown
Filed:	Herewith
For:	LOCK MECHANISM
Docket No.:	60130-2065; 02MRA0243

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Commissioner for Patents
P.O. Box 1450
Alexandra, VA 22313-1450

Dear Sir:

With regard to the above-referenced patent application, enclosed is a Certified Copy of prior corresponding document GB 0309266.5.

Respectfully submitted,

CARLSON, GASKEY & OLDS

Karin H. Butchko
Registration No. 45,864
400 West Maple, Suite 350
Birmingham, MI 48009
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Dated: April 16, 2004

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1. Your reference P303182GB/PMJF

2. Patent application number
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3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
ArvinMeritor Light Vehicle Systems (UK) Limited
Fordhouse Lane
Stirchley
Birmingham
West Midlands
B30 3BW
United Kingdom

Patents ADP number *(if you know it)*
08411480001

If the applicant is a corporate body, give the country/state of its incorporation
United Kingdom

4. Title of the invention
A Lock Mechanism

5. Name of your agent *(if you have one)*
"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*
WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number *(if you know it)*
1776001

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

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Number of earlier application	Date of filing *(day / month / year)*

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P303182GB

A Lock Mechanism

The present invention relates to a lock mechanism for a vehicle door latch. More particularly, the present invention relates to a lock mechanism including a superlock function.

Known latches are used to releasably secure vehicle doors in a closed position. They are mounted on the door and include a retention plate having an opening which receives the striker, which striker is typically mounted on a fixed structure of the vehicle. A latch bolt in the form of a rotatable claw having a mouth is typically pivotably mounted to the retention plate and is provided with fully latched and first safety abutments against which a pawl also pivotally mounted to the retention plate may engage. Thus as the door is closed, the striker enters opening and the mouth of the claw, causing the claw to rotate and the pawl to engage one of the abutments, thereby releasably retaining the claw and maintaining the door in a closed position. Mechanical or electrical linkages are provided from known latches to handles, buttons and the like to control the operation thereof.

Latches on different vehicles, and in particular different latches on a particular vehicle will have different security/operating modes. Thus, a latch may be:-

a) openable by operation of an inside door handle,
b) openable by operation of an outside door handle,
c) lockable by operation of an inside sill button or the like,
d) lockable by operation of an outside key barrel or the like,
e) lockable by operation of a remote keyless entry (RKE) device,
f) superlockable by operation of a RKE device or outside key barrel.

The state of a particular latch may include one or more of the following modes:-

a) unlocked
b) locked (i.e. operation of an outside door handle does not unlatch the latch but operation of an inside door handle does unlatch the latch)

c) superlocked (wherein any number of operations of an inside or an outside door handle, in any order, does not unlatch the latch)

d) child safety on (wherein operation of an inside door handle does not unlatch the latch, whereas operation of an outside door handle may or may not unlatch the latch, depending upon whether the door is locked or unlocked).

Furthermore a certain sequence of events can be used to perform desired functions:-

a) Thus, with a locked latched door, operation of an inside door handle may unlatch the latch and, at the same time, unlock the latch. Thus, upon subsequent closing of the door, the door is unlocked, and hence can then be opened by operation of the outside door handle. This is known as override unlocking and prevents vehicle keys being locked in the vehicle. This mode of operation is also useful to provide for opening of a locked door which is in child safety on mode, since, whilst operating of an inside door handle does not unlatch the latch, it nevertheless unlocks the latch and hence a subsequent operation of an outside door handle then enables the latch to be unlatched.

b) A sill button associated with certain types of latches, typically driver door latches, cannot be depressed when the door is open. This is also to prevent keys being locked in the vehicle. The only ways of externally locking such a latch are to close the door and insert a key into a key barrel to lock the latch, or by operation of a RKE device.

c) Certain other types of latch require an outside door handle to be lifted, when the door is in the open position, so as to enable the sill button to be pushed down so as to lock the door when the door is subsequently closed. Thus, the driver has to perform a specific sequence of events (i.e. lift the outside door handle and then depress the sill button) in order to lock the door. This again is aimed at preventing keys being locked in the vehicle.

It can be seen that there are several modes of operation of known door locks and the way in which these functions are performed are typically carried out by mechanisms of the door latch (as opposed to mechanisms remote from the door latch). Ultimately,

whichever mechanism is used, the door will only open when the pawl is moved out of engagement from the claw. Thus, locking, superlocking, and child safety modes all relate to providing a connection between a door handle, or power actuator (e.g. electric motor) driven under the influence of a signal received from an RKE device or door handle, and the pawl in order to move the pawl or breaking any such connection or blocking any such connection so as to prevent movement of the pawl.

Car door latches are typically mounted at the rear of a car door which car door is pivotally mounted at a front edge. Typically an inside door handle is mounted on the inside of the door, towards the front edge and therefore a connection needs to be provided connecting the inside door handle with the door latch. Depending on the location of the inside door handle and the nature of the connection with the latch (e.g. in some cases the nature of the connection is simply to provide the unlatching of the door, whereas in other cases the nature of the connection is to provide for unlocking and unlatching of the door), different latches require different types of connection and orientation of connection so as to be able to actuate the door latch.

In doors fitted with sill buttons or other visual means of indicating the locked state of a particular latch and of changing that locked state, it has previously been the case with superlocking latches that it is possible to manually manipulate the sill button or other visual status indicator to provide an indication corresponding to that particular latch being unlocked, whereas in fact the latch remains superlocked. This situation is undesirable since it results in uncertainty in the mind of a vehicle user as to whether a latch remains superlocked, locked or unlocked. In turn this may result in a user pulling hard on an inside or outside handle to unlatch the latch under the misconception that it is unlocked when it is not, which may cause damage to the latch or associated linkages.

The present invention seeks to overcome or at least mitigate the problems of the prior art.

Accordingly, one aspect of the present invention provides a lock mechanism for a vehicle door latch comprising a lock actuator drivingly coupled to a lock link for

movement of the lock link between a first position corresponding to a locked state of a latch and a second position corresponding to an unlocked state of the latch, the mechanism further comprising a superlock actuator drivingly connected to a superlock link slidably mounted for movement of the superlock link between a third position corresponding to superlocked state of the latch and a fourth position corresponding to a non-superlocked state of the latch, a fixed abutment surface and an inside lock lever mounted such that in the fourth link position, movement of the lock link between the first and second positions may be achieved and in the third position the relative positions of the inside lock lever and lock link and abutment surface are such that movement of the lock link between the first and second positions is prevented.

Another aspect of the present invention prevides a child safety mechanism for a vehicle door latch comprising an inside release link, a wedge block and a wedge block support, the wedge block being movable on the support between a first position at which the inside release link is in a child safety off position and is actuable by a linkage from an inside door handle to permit a latch to be released and a second position in which the wedging action of the wedge block places the release link in a child safety on position, such that the release link is not actuable by the linkage.

Embodiments of the present invention are now described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a latch incorporating a lock mechanism according to an embodiment of the present invention when fitted to the vehicle passenger door;

Figure 2 is a perspective view of a partially assembled portion of the latch of Figure 1;

Figure 3 is a perspective view of the latch of Figure 2 at a later stage of assembly;

Figure 3a is a side view of a portion of the latch shown in Figure 3;

Figure 4 is a side view of another portion of the latch of Figure 1 as viewed from direction A of Figure 1 when in a locked state;

Figure 5 shows a side view of the locking mechanism according to an embodiment of the present invention in detail when in a superlocked state;

Figure 6 is a detail side view of the locking mechanism of Figure 4 in an unlocked state;

Figure 7 is a perspective view of a lock link and inside lock lever of the mechanism of Figure 5;

Figure 8 is a perspective view of the underside of a superlock arm of the mechanism of Figure 5; and

Figure 9 is a perspective view of the superlock link of the mechanism of Figure 5.

Referring to Figure 1, a latch 10 is mounted to a vehicle side passenger door 12 at the intersection of a shut face 14 (at the door trailing edge) and inside face 16 thereof. A portion of the door is cut away to provide an opening 18 spanning the intersection, the opening being capable of receiving a striker (not shown) mounted to a fixed portion of the vehicle such as a door pillar 10 (not shown). A similarly dimensioned opening 20 is also provided in a retention plate 22 of the latch 10. The latch is generally L-shaped in plan view and comprises a first region 10a arranged proximate to the door trailing edge 14 and a second region 10b arranged proximate the door inner face 16, when installed in the door 12.

Referring now to Figure 2 it can be seen that a Claw 24 (also partially visible in Figure 1) is pivotally mounted to an inner face of the retention plate 22 in region 10a of the latch by pivot pin 26, and is arranged to receive the striker in a mouth 28 thereof. In Figures 1 and 2 the claw is shown in a released state. The claw 24 is biased into an open position by resilient means such as a spring (not shown). However, as it is caused to rotate by relative movement between the striker and latch 10 during closure of the

door 12, the claw 24 may be retained by a pawl 30 by engagement of a pawl tooth 32 thereof with either a first safety abutment 34 or fully latched abutment 36 on a periphery of the claw. The pawl 30 is pivotally mounted about a second pivot pin 38 and is resiliently biased by a spring 40 into contact with the claw 24, as is known.

Turning to Figures 3 and 3a, a cover plate 42 has been placed on the latch so as to partially obscure claw 24 and totally obscure the pawl 30. The cover plate 42 further shrouds mouth 20 of the retention plate 22 so as to minimise the ingress of dirt etc. into the latch 10 via the mouth.

Release link 46 is pivotably connected to a release link connector 45 by a pin 47. Connector 45 extends from a pawl lifter (not shown) which rotates about pin 38. Release link 48 is similarly connected. The pawl lifter and connector 45 rotate together about pin 38. The pawl lifter is biased in a direction B by a spring (not shown). Rotation of the main lock lever 44 in direction B, causes release links 46 and 48 to rotate anti-clockwise in direction D about pin 47 by the action of a cam portion 49 of link 44 to move to a locked position.

Links 46 and 48 are biased in a clockwise direction by a spring (not shown) so that when the main lock lever 44 returns to the unlock position, the links 46 and 48 also return to their unlocked position.

The latch 10 further comprises a child safety mechanism in the form of a slidable wedge shaped block 50, supported by the retention plate 22 at the intersection between its shut face portion 22a and inside face portion 22b. The mechanism is shown in a child safety off condition in Figure 3. However, if block 50 is slid to the right as shown in Figure 3, the resulting wedging action pivots link 48 in anti-clockwise direction X such that the linkage from the inside handle ISH misses the link 48, if actuated, and thus cannot release the latch, irrespective of the position of lock lever 44. The child safety mechanism may be moved manually by use of a suitable mechanism, but in this embodiment is connected to a power actuator via a suitable linkage, such as arm 52 shown in Figure 3, as described in greater detail below.

Lock lever 44 further comprises a recess formation 54 capable of engagement by a lock link 56 shown in broken lines in Figure 3 and pivotable about an axis that is at substantially 90 degrees to that of lock lever 44. Operation of the lock link 56 is discussed in greater detail below.

Referring to Figures 4 and 7, the lock mechanism 58 according to an embodiment of the present invention is shown in more detail when viewed from direction A of Figure 1. As such, it can be seen that the lock mechanism 58 is located in region 10b of the latch which essentially runs parallel to the inside face 16 of door 12, when installed.

The lock link 56 is rotatably mounted on a housing 60 of this portion of the latch and is rotationally fast with a quadrant 62 having gear teeth on its circumferential edge that are engaged with a pinion 64. In other embodiments, lock link and quadrant 62 may be formed integrally. Pinion 64 is coaxially pivotally mounted with a worm wheel 66 and has a dog clutch connection 65 therebetween enabling pinion 64 to rotate through slightly less than 180 degrees without rotation of the worm wheel 66 occurring. Worm wheel 66 is in turn driven by a lock power actuator in the form of a DC electric motor 68 via a worm gear 70. The motor 68 is capable of driving the worm wheel 66 in both clockwise and anti-clockwise directions. Operation of the motor is controlled by a controller 25.

In the context of the present invention, the term "power actuator" should be understood to encompass any actuator driven from a vehicle power source such as a vehicle battery. Specifically, the term should not be understood to mean an actuator such as a door handle whose power source is a vehicle user.

A manual inside lock lever 72 is coaxially mounted with respect to the quadrant 62 and lock link 56 and is rotationally fast with a sill button lever 74 illustrated schematically and provided on the opposite face of housing 60 to that shown. Thus, manipulation of sill button SB (illustrated schematically) may cause the manual inside lock lever 72 to

rotate in a clockwise or anti-clockwise direction. Sill button SB also provides a visual indication of the lock status of the latch 10.

The manual inside lock lever 72 is L-shaped, having two arms 72a and 72b. Arm 72a terminates in an angled edge 73. Manual inside lock lever 72 is **not** rotationally fast with lock link 56 or quadrant 62. However, the extent to which manual inside lock lever 72 may rotate relative to quadrant 64 is restricted in a clockwise direction by a stop 76 that is arranged to be capable of abutting arm 72b.

A radially extending slot 78 is provided in quadrant 62 and has a superlock link 80 slidably mounted therein. As may be seen most clearly from Figure 9 the superlock link 80 is substantially U-shaped and has two parallel spaced pins 80a and 80b which project out of the plane of quadrant 62, the first of which 80a, limits relative rotation of the manual inside lock lever in an anti-clockwise direction relative to the quadrant 62 by abutting arm 72a.

The radial position of superlock link 80 is controlled by a superlock power actuator in the form of DC electric motor 82. Operation of the motor is controlled by controller 25. An arm 84, the underside of which is shown in Figure 8, provides a drive connection between the motor 82 and superlock link 80. The end of arm 84 proximate motor 82 is provided with a gear rack 85 so that it rotation of an output pinion 86 from motor 82 causes the superlock arm 84 to move along its longitudinal axis with the motion being guided by pin 88 secured to housing 60 and slot 90 formed in the superlock arm 84. The pinion 86 is held in contact with the rack 85 by engagement of the output shaft of the motor with guide 87. The end of the arm 84 remote from motor 82 terminates in an arcuate slot 92 arranged to receive the second pin 80b of the superlock link 80. The arcuate shape of slot 92 enables the quadrant 62 and hence the link 80 to pivot with minimal axial movement of arm 84.

An abutment formation 94 shown in broken lines in Figure 4 is provided on the inside face of a top cover portion of the latch (not shown) that mates with housing 60 and is positioned at an acute angle relative to slot 78 when quadrant 62 is in the position

shown in Figure 4. Abutment formation 94 is further positioned such that it may abut pin 80b of superlock link 80 when this is in its radially outermost position on slot 78 (see Figure 5).

Region 10b of the latch further comprises a child safety power actuator in the form of DC electric motor 95 which is capable of driving wedge block 50 via worm gear 96, worm wheel 97, arm 98 and arm 52 shown in Figure 3. Operation of motor 95 is controlled by controller 25. A lug 99 of arm 98 engages a complimentary aperture 53 on arm 52 to transmit the drive.

In some classes of embodiment, region 10b may also contain switches or other sensors 35 (illustrated schematically) capable of detecting the state of various latch components so that this information may be utilised by the controller 25 for control of the latch functions.

Operation of the latch is as follows:

Starting from the locked condition shown in Figure 4 (with superlock link 80 not in the radially outermost position in slot 78) the latch 10 may be unlocked by lifting sill button SB, causing manual inside lock lever 72 to take up any lost motion between arm 72a thereof and pin 80a, and then to cause quadrant 62 to rotate anti-clockwise in conjunction with lock link 56. This in turn moves locking lever 44 into an unlocked position and enables the latch to be opened either by actuation of the outside handle OSH or inside handle ISH (unless child safety is on). Additionally, it should be noted that rotation of quadrant 62 also causes gear 64 to rotate in a clockwise direction. However, due to the dog clutch arrangement, this does not result in back driving of motor 68. After this unlocking operation, the lock mechanism 58 is in the position shown in Figure 6.

Starting again from the locked condition shown in Figure 4, the latch may also be power unlocked by unlocking motor 68 in response to, for example, a signal from a remote keyless entry device (not shown). In this situation, the controller 25 signals the

powering of lock motor 68, thus causing pinion 64 to rotate clockwise via worm gear 70 and worm wheel 66, which as with manual unlocking causes the quadrant 62 and lock link 56 to rotate anti-clockwise resulting locking lever 44 moving to an unlocked position. This anti-clockwise rotation also causes sill button lever 74 to rotate anti-clockwise and lift the sill button due to contact between lug 76 and arm 72b.

Referring to Figure 5, which shows the lock mechanism 58 in a superlocked state, it can be seen that superlock actuator motor 82 has moved the superlock arm 84 in a direction away from lock link 56, thus causing superlock link to move to the radially outermost position within slot 78. In this position pin 80b abuts abutment surface 94. Thus, if a user of the vehicle attempts to lift sill button SB to cause anti-clockwise rotation of manual inside lock lever 72, angled edge 73 thereof contacts pin 80a of superlock link 80. The arrangement of edge 73 urges the superlock link 80 radially outwardly against the end of slot 78 and against the abutment surface 94, thus preventing anti-clockwise rotation of quadrant 62, as well as preventing the lifting of sill button SB. Therefore, locking lever 44 remains in its locked position and actuation of either the inside handle or outside handle cannot result in release of the latch.

When lock link 56 and quadrant 62 are rotated clockwise, either due to operation of the RKE or unlocking via the key, lock link 56 drives quadrant 62, and therefore superlock link 80, anti-clockwise, causing pin 80b to contact angled abutment 94. In turn, this causes superlock link 80 to move radially inwards in slot 78. Even if at the start of the operation lever 72 abuts the superlock link 80, the lost motion connection between lever 72 and quadrant 62 means that lever 72 rotates clockwise relative to the quadrant until it abuts lug 76 during anti-clockwise drive of quadrant 62.

Thus the wedging action between face 73, pin 80a, face 94 and pin 80b does not occur and unlocking is not impeded. Lever 72 can rotate anti-clockwise and pin 80b is pushed further to the left by face 94, thereby cancelling superlock. The superlock motor is backdriven.

Changing the state of the latch from unlocked to locked or superlocked is essentially the reverse of the unlocking and un-superlocking operations described above.

It will be appreciated that the lock mechanism as described above ensures that the status of the lock as indicated by sill button SB is always the same as the actual status of the lock mechanism 58 of the latch, thus ensuring that there is no doubt in the mind of a vehicle user as to the status of a particular latch on their vehicle.

It will be appreciated that numerous changes may be made within the scope of the present invention. For example, the mechanism may be adapted for use with manually actuable latches in which superlock motor 82 may be replaced by a suitable linkage to a key barrel, for example, mounted on the exterior of a vehicle door to which the latch is fitted, and further by dispensing with lock motor 68 and the associated gears. An alternatively arranged superlock link comprising, for example, a single pin may be used and the locking mechanism may be adapted so as to be actuated in a linear rather than rotary manner. Alternative means of indicating the locked state of the latch and also changing the status may be used, rather than a sill button. Examples of these may be buttons provided proximate the inside handle or the position of the inside handle itself (e.g. pushed inwards from a normal rest position when locked). The abutment surface may be provided on any body that is fixed relative to the lock link and superlock link. The superlock link may be movably mounted on any suitable body that is rotationally fast with the lock link.

Claims

1. A lock mechanism for a vehicle door latch comprising a lock actuator drivingly coupled to a lock link for movement of the lock link between a first position corresponding to a locked state of a latch and a second position corresponding to an unlocked state of the latch, the mechanism further comprising a superlock actuator drivingly connected to a superlock link slidably mounted for movement of the superlock link between a third position corresponding to superlocked state of the latch and a fourth position corresponding to a non-superlocked state of the latch, a fixed abutment surface and an inside lock lever mounted such that in the fourth link position, movement of the lock link between the first and second positions may be achieved and in the third position the relative positions of the inside lock lever and lock link and abutment surface are such that movement of the lock link between the first and second positions is prevented.

2. A lock mechanism according to Claim 1 wherein the superlock link is mounted for movement together with the lock link.

3. A lock mechanism according to Claim 1 or Claim 2 wherein the lock link is pivotally mounted.

4. A lock mechanism according to Claim 3 wherein the lock link is rotationally fast with a gear quadrant for transmission drive from a lock actuator.

5. A lock mechanism according to Claim 3 or Claim 4 wherein the inside lock lever is pivotally mounted.

6. A lock mechanism according to Claim 5 wherein the inside lock lever is pivotally mounted about the same axis as the lock link.

7. A lock mechanism according to any preceding Claim wherein a lost motion connection is provided between the inside lock lever and lock link.

8. A lock mechanism according to any one of Claims 3 to 7 wherein the superlock link is slidably mounted in a slot and the slot is arranged with the longitudinal axis thereof extending substantially radially from the centre of rotation of the lock link.

9. A lock mechanism according to any preceding Claim wherein the superlock link comprises a pin.

10. A lock mechanism according to Claim 9 wherein the superlock link comprises two pins whose respective longitudinal axes are provided in a spaced parallel arrangement.

11. A lock mechanism according to any preceding Claim wherein the inside lock lever is provided with an angled edge arranged so as to contact the superlock link when in a superlocked position thereof.

12. A lock mechanism according to any preceding Claim wherein the abutment surface is angled relative to the path of movement of the superlock link between the superlocked and non-superlocked positions.

13. A lock mechanism according to any preceding Claim wherein a superlock arm drivingly connects the superlock actuator to the superlock link.

14. A lock mechanism according to Claim 13 wherein the superlock arm is provided with an arcuate slot for receiving the superlock link.

15. A lock mechanism according to any preceding Claim wherein the lock actuator and/or the superlock actuator is a power actuator.

16. A latch incorporating a lock mechanism according to any preceding Claim.

17. A child safety mechanism for a vehicle door latch comprising an inside release link, a wedge block and a wedge block support, the wedge block being movable on the support between a first position at which the inside release link is in a child safety off position and is actuable by a linkage from an inside door handle to permit a latch to be released and a second position in which the wedging action of the wedge block places the release link in a child safety on position, such that the release link is not actuable by the linkage.

18. A child safety mechanism according to Claim 17 wherein the wedge block support is a retention plate or latch housing.

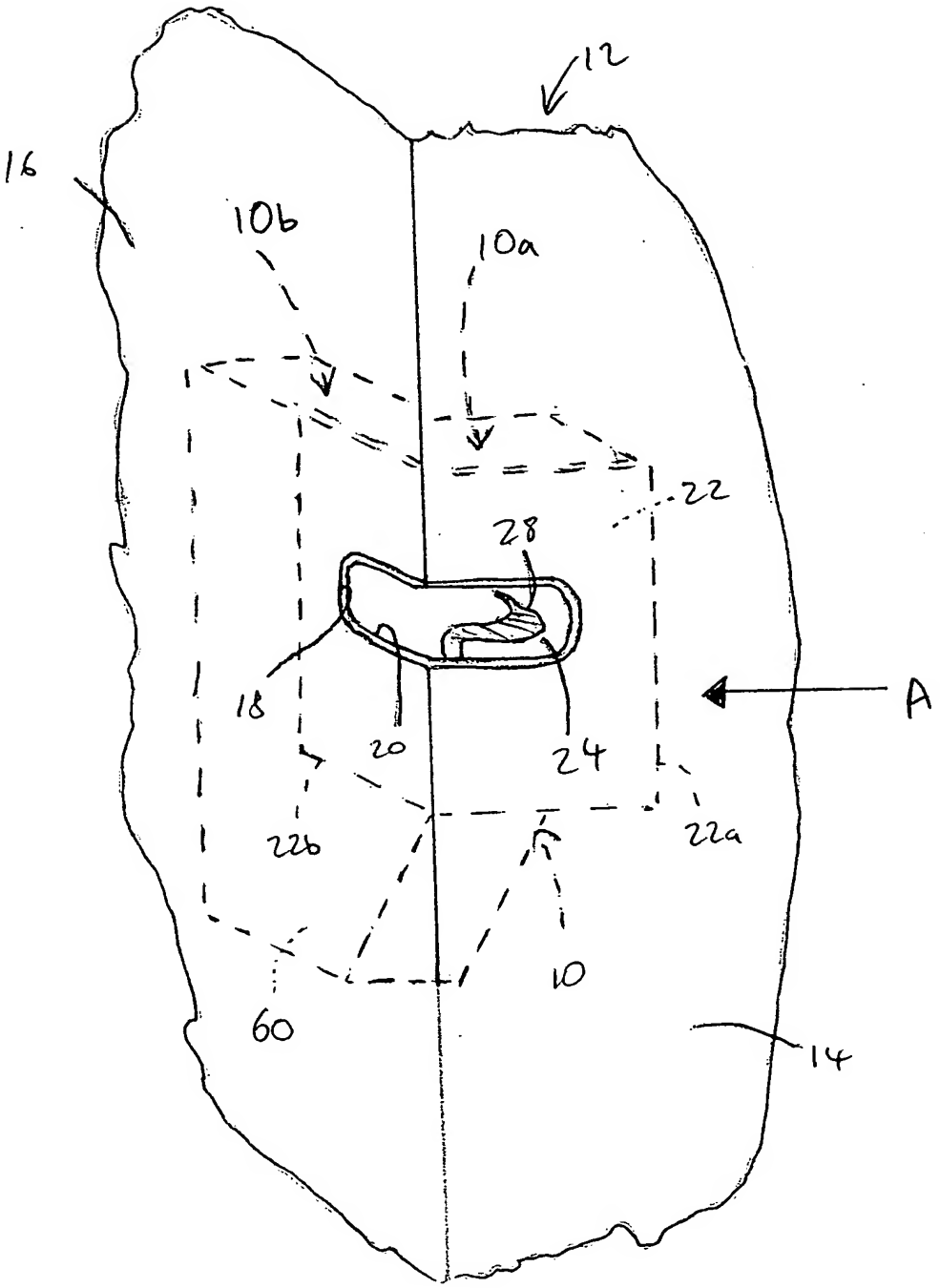

FIG. 1

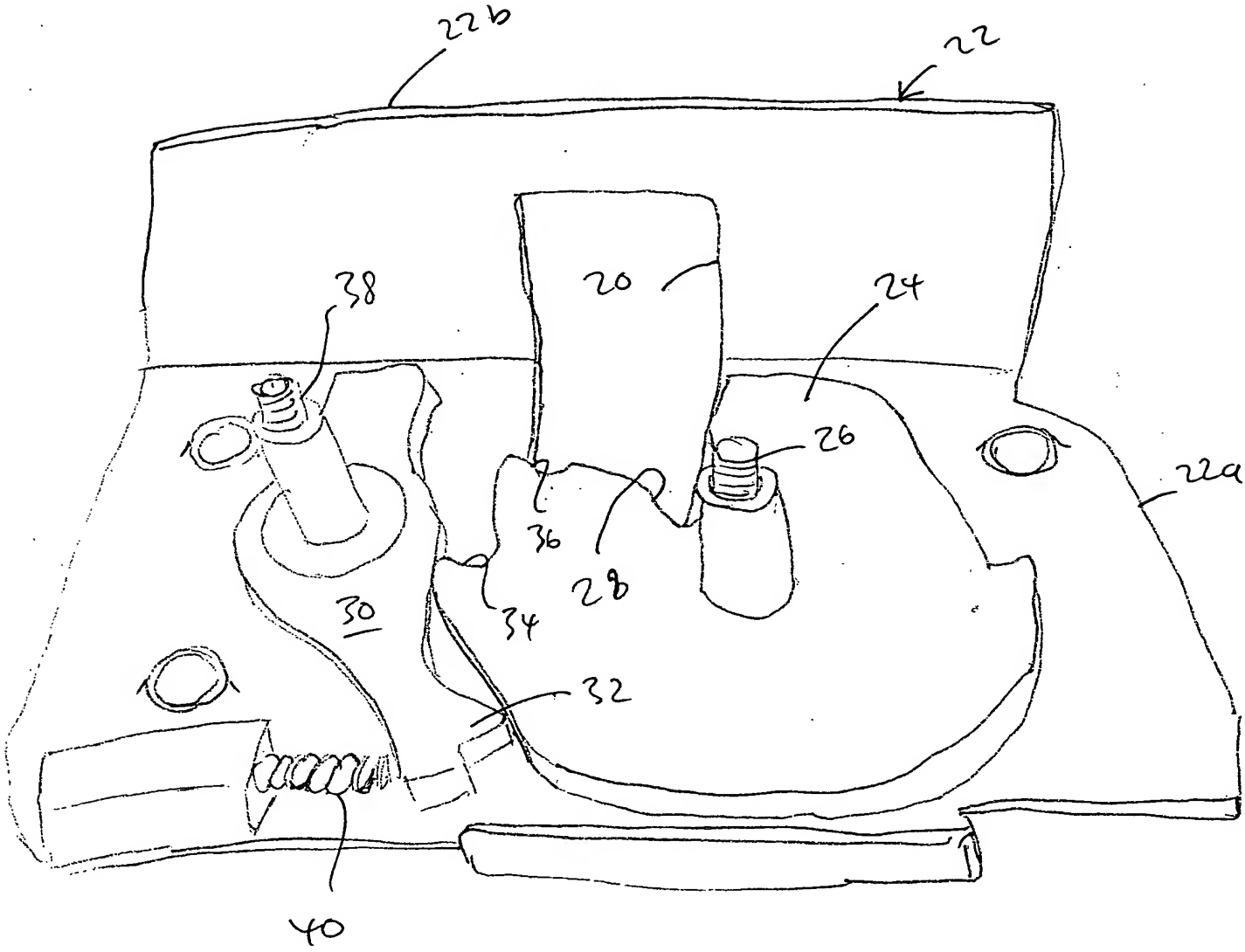

FIG. 2

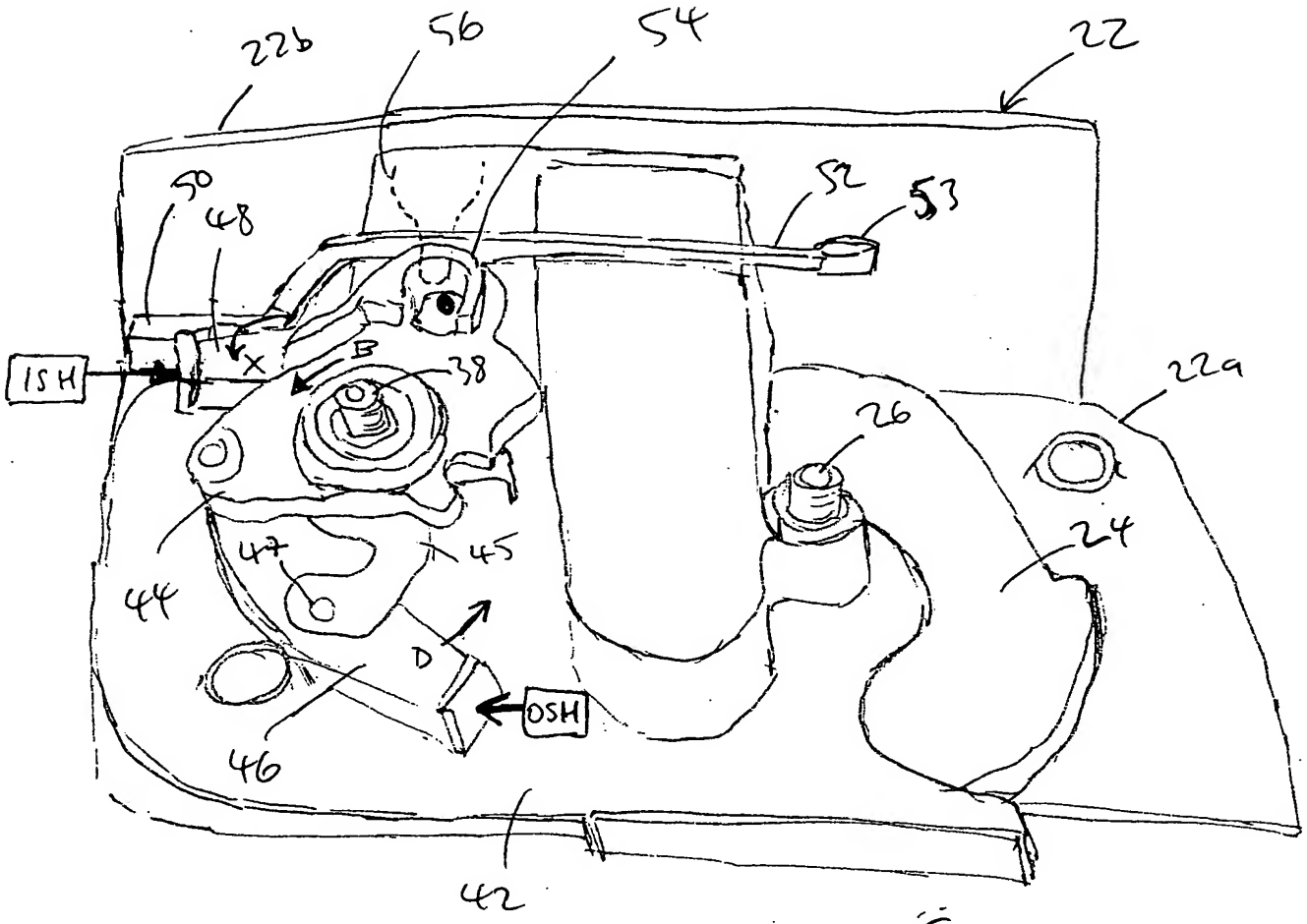
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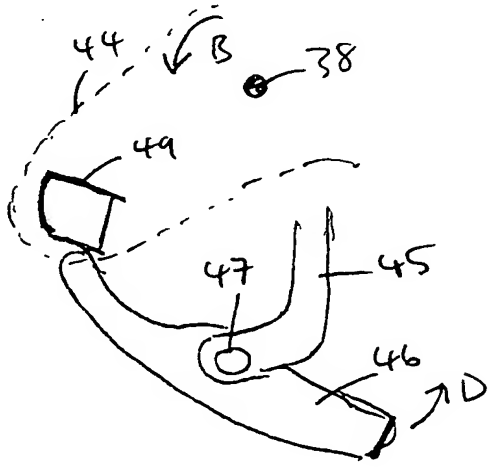
FIG. 3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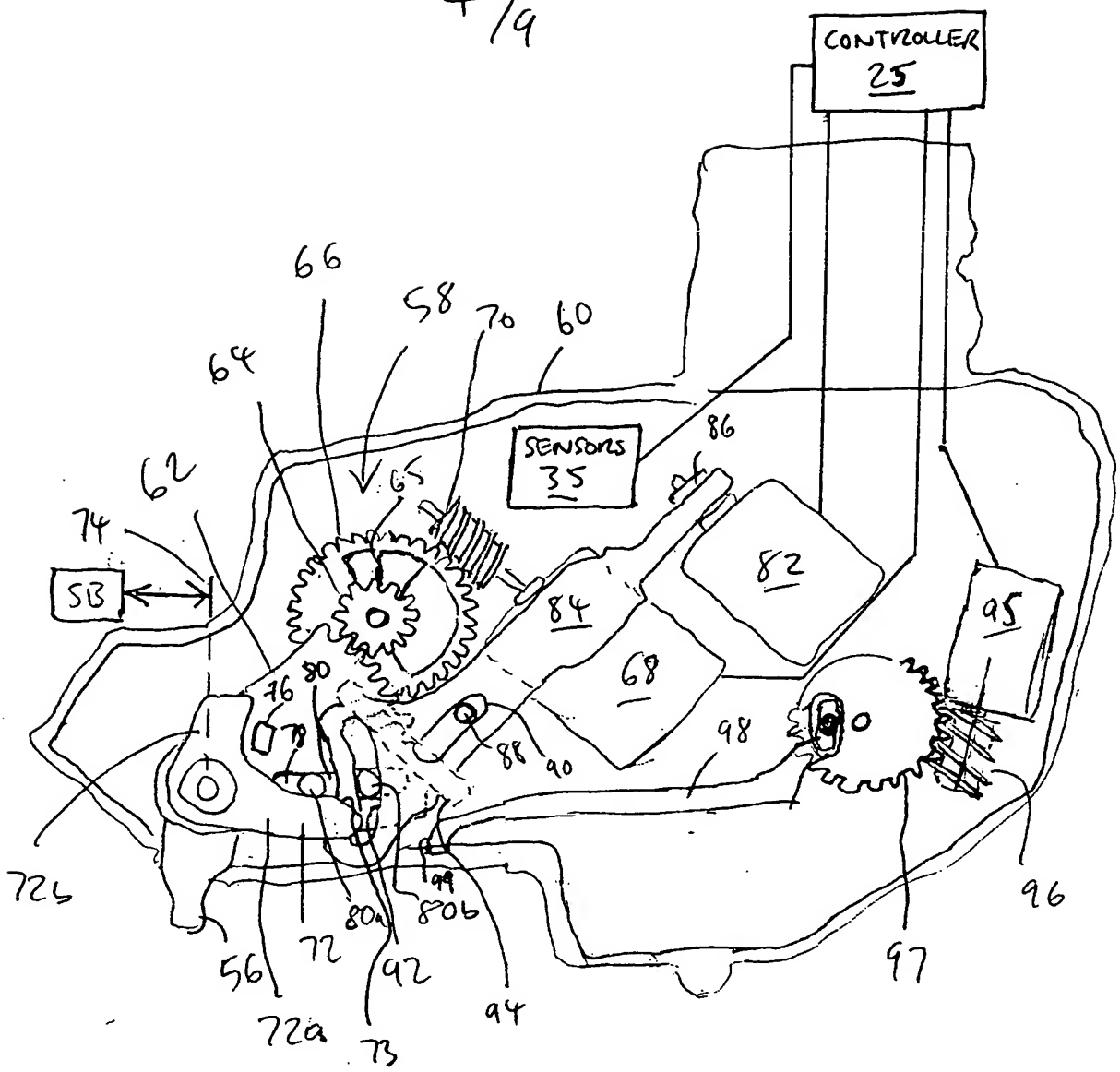
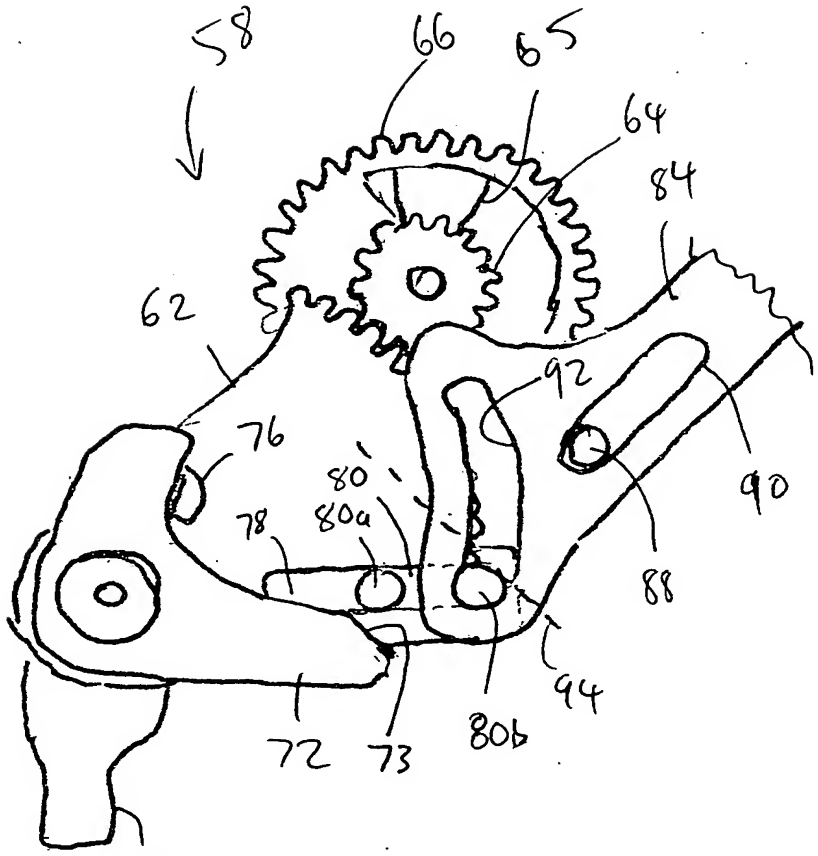
D

FIG 3A


CONTROLLER
25
SENSORS
35
SB
66
58
70
60
64
62
74
65
86
82
84
68
95
76
80
88
90
98
72b
56
72
80a
80b
99
92
94
72a
73
97
96

LOCKED

FIG. 4



SUPERLOCKED

FIG. 5

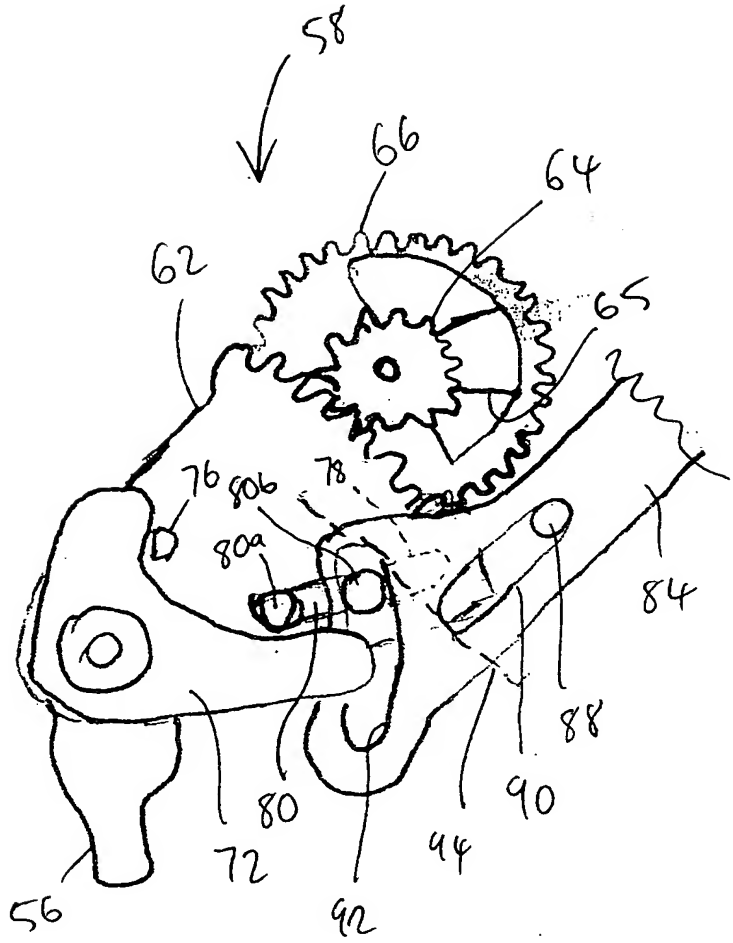


FIG. 6

FIG. 7

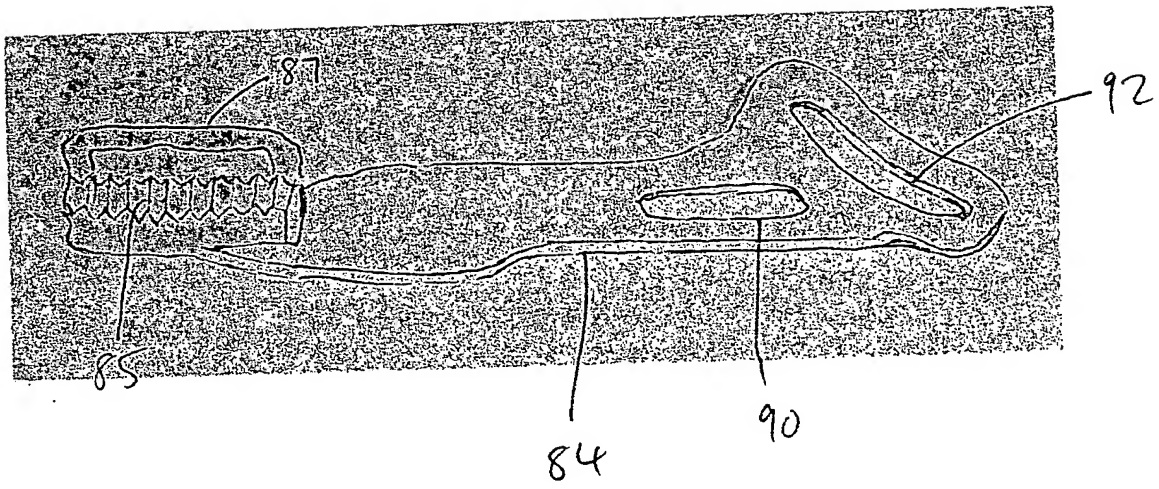


FIG. 8

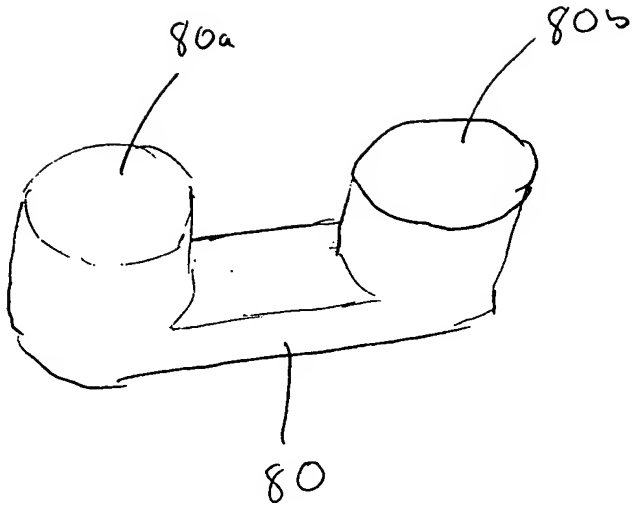


FIG. 9